

Claims

1. A method for routing a datagram in an IP network, said method comprising the steps of:

receiving a datagram with a destination network address;

5 identifying a next hop router en route to or associated with said destination network address; and

determining whether or not transmission of said datagram on a link to said next hop router would result in a bandwidth usage exceeding a bandwidth threshold associated with said next hop router, and

10 if not, updating the bandwidth usage associated with said next hop router, and transmitting said datagram to said next hop router,

if so, selecting among other possible next hop routers en route to or associated with said destination address, another next hop router for which transmission of said datagram on a link to said other next hop router would not result in a
15 bandwidth usage exceeding a bandwidth threshold associated with said other next hop router, updating the bandwidth usage associated with said other next hop router, and transmitting said datagram to said other next hop router.

2. The method as set forth in claim 1, wherein the step of selecting comprises the steps of:

20 if, among said other possible next hop routers, there is no other next hop router for which the transmission of the datagram on the respective link would result in the

bandwidth usage being less than the respective bandwidth threshold, then choosing among said other possible next hop routers, another next hop router, updating the bandwidth threshold associated with said other, chosen next hop router with a larger, predefined bandwidth threshold; and

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transmitting the datagram to said other, chosen next hop router.

3. The method as set forth in claim 1 wherein the step of determining, comprises the step of adding a bandwidth usage associated with said next hop router immediately before transmission of said datagram on said link to said next hop router to a bandwidth
10 usage required for transmission of said datagram on said link to said next hop router, and comparing a result of said adding step to the bandwidth threshold associated with said next hop router.

4. The method as set forth in claim 1 wherein the step of updating the bandwidth usage associated with the first said next hop router, comprises the step of updating in a
15 table, the current bandwidth usage with the estimated bandwidth usage.

5. The method as set forth in claim 1 wherein said step of determining comprises the steps of:

determining a current time;

retrieving from a table, a minimum time to emit a next datagram; and

20 comparing a current time with said minimum time to emit a next datagram.

6. The method as set forth in claim 1, wherein the step of updating the bandwidth usage associated with said next hop router, comprises the steps of:

computing a new minimum time to emit a next datagram based on a minimum time to emit a next datagram plus a size of the datagram to transmit divided by the bandwidth threshold of the link to said next hop router.

7. The method as set forth in claim 2 , wherein the step of choosing among said
5 other possible next hop routers, comprises the step of choosing among said other possible next hop routers, a next hop router according to a shortest path algorithm.

8. The method as set forth in claim 1, wherein a bandwidth usage of a link to said next hop router is based on other datagrams that have been transmitted on said link within a time period prior to a current time.

10 9. A router for routing a datagram in an IP network, said router comprising:

means for receiving a datagram with a destination network address;

means for identifying a next hop router en route to or associated with said destination network address; and

15 means for determining whether or not transmission of said datagram on a link to said next hop router would result in a bandwidth usage exceeding a bandwidth threshold associated with said next hop router, and

if not, updating the bandwidth usage associated with said next hop router, and transmitting said datagram to said next hop router,

20 if so, selecting among other possible next hop routers en route to or associated with said destination address, another next hop router for which transmission of

said datagram on a link to said other next hop router would not result in a bandwidth usage exceeding a bandwidth threshold associated with said other next hop router, updating the bandwidth usage associated with said other next hop router, and transmitting said datagram to said other next hop router.

5 10. A computer program product for routing a datagram in an IP network, said program product comprising:

a computer readable medium;

first program instructions to receive a datagram with a destination network address;

10 second program instructions to identify a next hop router en route to or associated with said destination network address; and

third program instructions to determine whether or not transmission of said datagram on a link to said next hop router would result in a bandwidth usage exceeding a bandwidth threshold associated with said next hop router, and

15 if not, update the bandwidth usage associated with said next hop router, and transmit said datagram to said next hop router,

20 if so, select among other possible next hop routers en route to or associated with said destination address, another next hop router for which transmission of said datagram on a link to said other next hop router would not result in a bandwidth usage exceeding a bandwidth threshold associated with said other next hop router, update the bandwidth usage associated with said other next hop router, and transmit said datagram to said other next hop router; and

wherein said first, second and third program instructions are recorded on said medium.